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1 8. STRUCTURES TO MAINTAIN BED OR BANK SCOUR - [MODERATE]

- Create scour for rearing, holding and spawning (sorting and stability of bed material) habitat. These aren't necessarily just specific structures. Random placement of debris performs a valuable function in some situations.
- Supplement info on groins and barbs in ISPG, but clarify difference in objectives (protection vs. creation through scour).
- To create and maintain diverse bedform and thalweg.
- To encourage gravel deposition/stabilization/sorting.
- Include rock piles, groins, deflectors, digger log, debris jams (detailed elsewhere), vortex rock weirs, rock J-hooks, "V" log weirs, "unstructured" debris placement.

1.1 Introduction

1.1.1 Description of Technique

Functions: To create and maintain diverse bedform and thalweg. To encourage gravel deposition/stabilization/sorting.

Depending on materials employed, may be a relatively short-term fix.

1.1.2 Physical and Biological Effects

- Scour and deposition
- Channel Substrate Sorting and Retention
- Habitat Complexity At All Discharges
- Bed and Bank erosion
- Nutrient retention (salmon carcasses and other organics)
- Channel backwatering
- Can enhance fish spawning, rearing, holding, and cover habitat. Discuss species and age class of fish that would benefit. Note any differences in seasonal use.

1.1.3 Application of Technique

- Transport Reach vs. Depositional Reach
- Reaches where there is an identified physical or biological need
- Alluvial

- Non-Alluvial
- Backwatered reaches vs. free flowing
- Stable vs. unstable or degraded stream reaches
- For use in newly constructed or existing stream channels and side channels.
- Limited by equipment access and reach – helicopters are some times used.

1.2 Scale

- Small streams vs. large rivers
- Single vs. complex structures
- What types of professionals need to be consulted?

1.3 Risk and Uncertainty

- Risk to public safety
- Urban vs. non-urban
- Risk to adjacent property
- Large vs. small streams
- High gradient vs. low gradient stream reaches
- Confined vs. unconfined stream reaches
- Varies with the method. Some methods are more experimental than others.

1.4 Data Collection and Assessment

- Biological assessment of habitat needs in subject reach.
- Hydrology and hydraulics
- Sediment,wood, and debris size and transport
- Fluvial Geomorphic Assessment and History
- Watershed Processes and History
- Other studies, experiences, literature review (at least for more experimental techniques)

1.5 Methods and Design

Consider natural channel processes (e.g., pool frequency and location).

Discuss material selection—natural and naturally occurring vs. artificial or not naturally occurring

Discuss the difference in function of various types of structures: those that lie low in profile (e.g., vortex weirs and J-hooks) or flush with the bank vs. those that block a significant portion of the channel cross-

section; those that are placed high in the channel cross-section vs. those that protrude into the channel thalweg, those that highly influence channel hydraulics vs. those that don't.

- Methods: Include rock piles, groins (detailed elsewhere), deflectors, digger log, debris jams (detailed elsewhere), vortex rock weirs, rock J-hooks, "V" log weirs, "unstructured" debris placement, boulder placement. Discuss the advantages and disadvantages of each of the methods and under what site conditions they might best apply. For "unstructured" debris placement, describe river continuum theory as it relates to wood—where wood naturally accumulates, types of configurations formed, and function provided by wood in steep headwater streams vs moderate gradient vs large low gradient rivers.

Design: Include anchoring and placement, hydraulic evaluation of result/impact

Potential unintended impacts. What channel conditions are most likely to cause them?

Discuss uncertainty in hydraulic design

1.6 Project Implementation

1.6.1 Permitting

Project Volumes (Cut and Fill), Construction Design and Methods

Construct Drawings, Plan Views and Maps

Sediment Control Plan

Heavy Equipment Fueling Areas and Spill Plan

Access Area Rehabilitation Plans

1.6.2 Construction

Fish Species Work Window and Construction Timing
Equipment Access Areas
Equipment size, type
Materials

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1.6.3 Cost Estimation

Nooksack River scour structures
Variability and range of rock and wood costs
Variability and range of equipment/installation costs

1.6.4 Monitoring and Tracking

Monitoring methods recommended depends of what you're trying to learn. Potential questions include: "did the structure stay in place or remain structurally sound?", did the treatment affect overall fish production in the system?, does the structure provide favorable fish habitat (what fish, season, and age class)? Depending on the objective and in addition to monitoring elements described in Section 5.x.x, monitoring may include the following elements:

- Section and Profile Data
- Bed Substrate Data
- Photo Points
- Reach Based Fish Snorkeling
- Wood tagging
- Large woody material survey

1.6.5 Contracting Considerations

- Time and Materials vs. Construction Contracting
- Contractor Experience

1.7 Operations and Maintenance

- Relative to monitoring and objectives .

1.8 Examples

Nooksack River scour structures

1.9 References

References cited in this technique so it is a stand-alone pullout.

1.10 Photo and Drawing File Names

List filenames and file locations of any photos and drawing files associated with this technique

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